V. Individual Risk Factors

In addition to association with demographic characteristics, such as age and gender, asthma is associated with other individual level risk factors. These include characteristics of people that are determined on a person-by-person basis, and which make an individual person more vulnerable to development of asthma or to environmental exposures that cause asthma. Some are within an individual's control, such as smoking. Others are not, such as genetic risk.

A. Cigarette Smoking

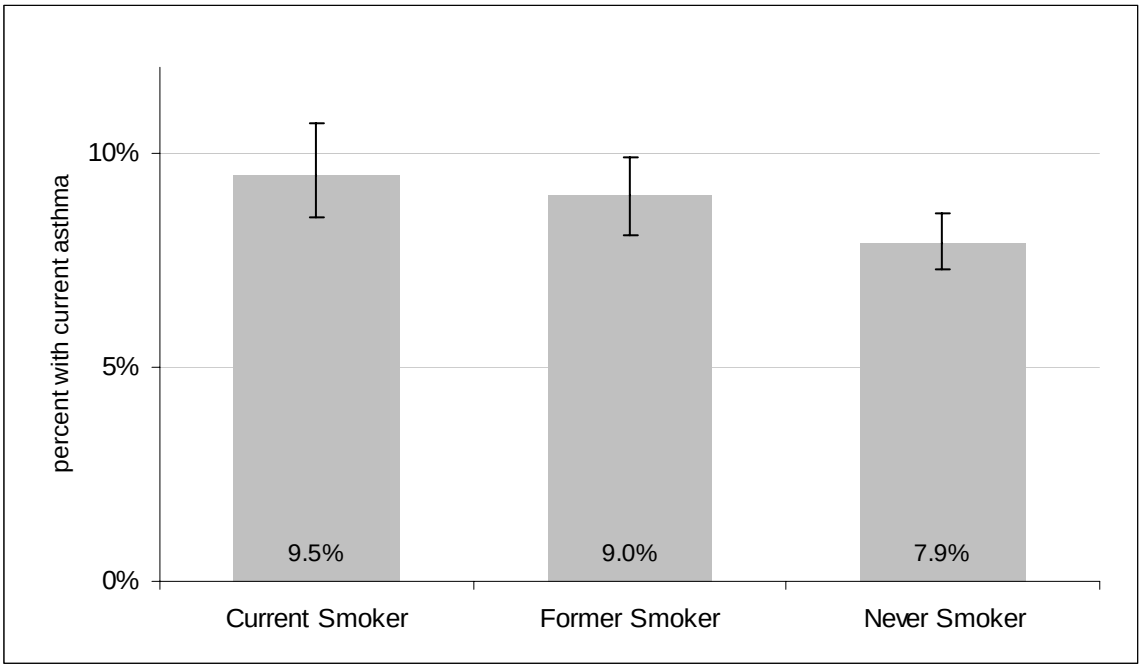
Active Smoking

Tobacco smoke is a well-documented potent trigger for asthma. There is conflicting evidence as to whether active smoking is a risk factor for asthma. Some studies have shown no association, or a weak association, **Error! Bookmark not defined. Error! Bookmark not defined.** [i] [ii] [iii] while others have demonstrated a clear association.[iv] [v] The possible link between asthma and smoking is difficult to study for a number of reasons. Smokers who develop asthma may have higher quit rates than those without asthma. Persons with sensitive airways may be less likely to initiate smoking.**Error! Bookmark not defined.** Another issue is that smokers who develop emphysema or other smoking-related respiratory illnesses may be misclassified as having asthma**Error! Bookmark not defined.** and if this were the case, smoking would appear to be associated with asthma.

Researchers agree that smokers with asthma have more severe symptoms than people with asthma who don't smoke. The Epidemiological Study on the Genetics and Environment of Asthma found that current smokers had more asthma symptoms, more frequent attacks, and higher severity scores. In another study, smokers' asthma symptoms were more likely to affect their daily activities than nonsmokers.[vi] Several studies have also found that asthma severity is related to duration of smoking.

In Washington, smoking history was associated with current asthma (see Figure 44, p=.02). Current smokers (people who smoke every day or just on some days, combined) had the highest prevalence of asthma, former smokers somewhat less, and never-smokers had the lowest prevalence of current asthma.

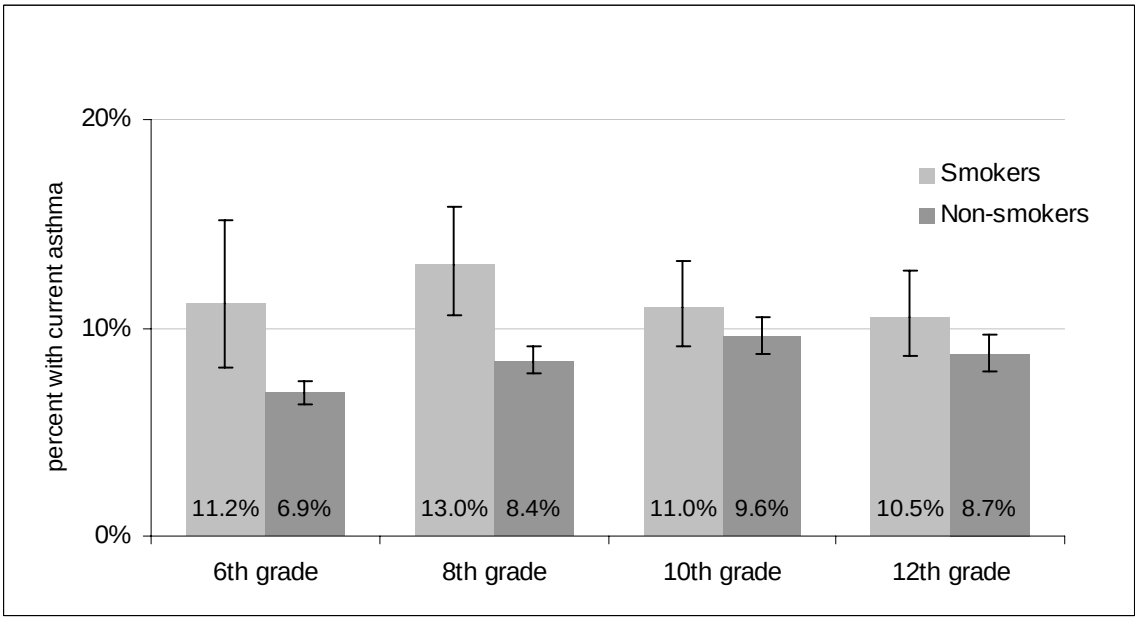
Figure 1: Asthma prevalence by cigarette smoking status, among Washington adults



Source: 2001-03 combined Washington State Behavioral Risk Factor Surveillance System (BRFSS).

Among Washington middle school-aged youth (p=.003 for 6th grade; p<.001 for 8th grades) current smoking is strongly associated with asthma, but the association is not significant for high school-aged youth (see Figure 45).

Figure 2: Asthma Prevalence by cigarette smoking status among Washington youth



Source: 2002 and 2004 combined, Washington State Healthy Youth Survey (HYS)

The data suggest that early initiation of smoking may be a risk factor for asthma; however, other factors may explain the association seen here between youth smoking and asthma. Smoking is associated with socio-economic status (youth from lower income families smoke more[vii] and are also at increased risk for asthma). Also, youth who smoke may be more likely to have additional exposure to secondhand smoke at home, which is recognized as a potent trigger for asthma among children. [viii] [ix] These associations may also be related to maternal smoking during pregnancy, which has been shown repeatedly to be associated with an increased risk of asthma among children, in some, though not all, studies.[x] [xi] [xii] [xiii]

Maternal Smoking during Pregnancy

The association between childhood asthma and maternal smoking during pregnancy has been inconsistent. Researchers face some difficulty in separating prenatal from postnatal exposure, as most mothers who smoke during pregnancy continue to smoke after delivery. A summary review concluded that although there are a number of studies indicating that prenatal exposure may elevate risk, postnatal exposure is likely more important. However, one recent study which included women who reported successful long-term smoking cessation and no household smoking, reported an 80% increased risk of asthma in their children. Other recent evidence has related *in utero* exposure to decreased lung growth in all children, with more severe changes in children with asthma.[xiv]

Smoking during pregnancy has been gradually declining over time in Washington. In 2003, 10.9% of mothers reported smoking during pregnancy. This translates into between 7,000 – 8,000 infants born to mothers who smoke during pregnancy. [xv] Smoking during pregnancy has been addressed by a number of public health programs because of a variety of adverse health effects for the mother and child,[xvi] so asthma is only one among many reasons to continue these interventions.

B. Obesity

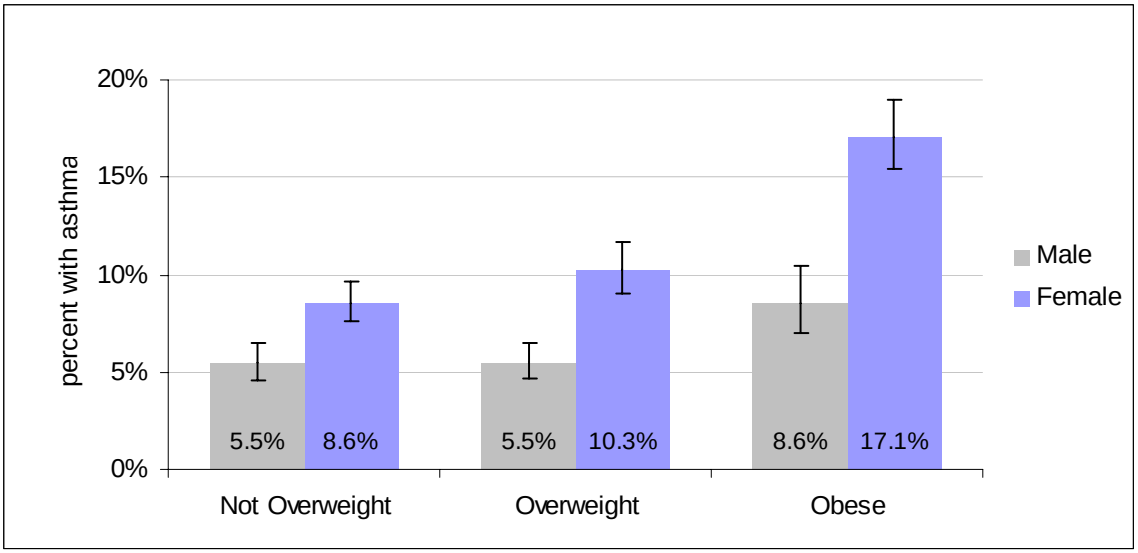
Among Washington adults, increasing levels of overweight[1] were significantly associated with increasing prevalence of asthma for women and men (see Figure 46). Nearly one in five obese women reported having asthma in contrast to one in ten women who were not overweight. Among men, the prevalence of asthma was lower than for women within all bodyweight categories, and the prevalence for overweight and not overweight men was similar (6%) but higher for obese men (9%).

Multiple studies, including a few longitudinal studies, suggest an association between higher body mass index and a higher prevalence of asthma or greater risk of developing asthma, especially in women.[xvii] [xviii] [xix] Evidence exists that weight loss in obese people with asthma decreases symptoms and morbidity, and improves lung function.[xx] Clear explanations for a link between obesity and asthma prevalence are lacking, but some

[1] See technical notes for discussion of overweight and obesity measurement. Significant association between current asthma and obese (vs. overweight or not obese): p<.001 for women, p=.004 for men.

evidence exists that estrogens may be a risk factor for asthma,**Error! Bookmark not defined.** and in women obesity may be associated with higher levels of bio-available estrogens. Other suggested mechanisms include chest wall restriction with a resultant decrease in airway caliber, increased bronchial reactivity, and/or an increase in gastro-esophageal reflux disease. The prevalence of obesity in Washington State has doubled over the past decade[xxi] and if obesity is causal for asthma this could explain some of the statewide increase in asthma prevalence.

Figure 3: Asthma prevalence by bodyweight and gender, among Washington adults



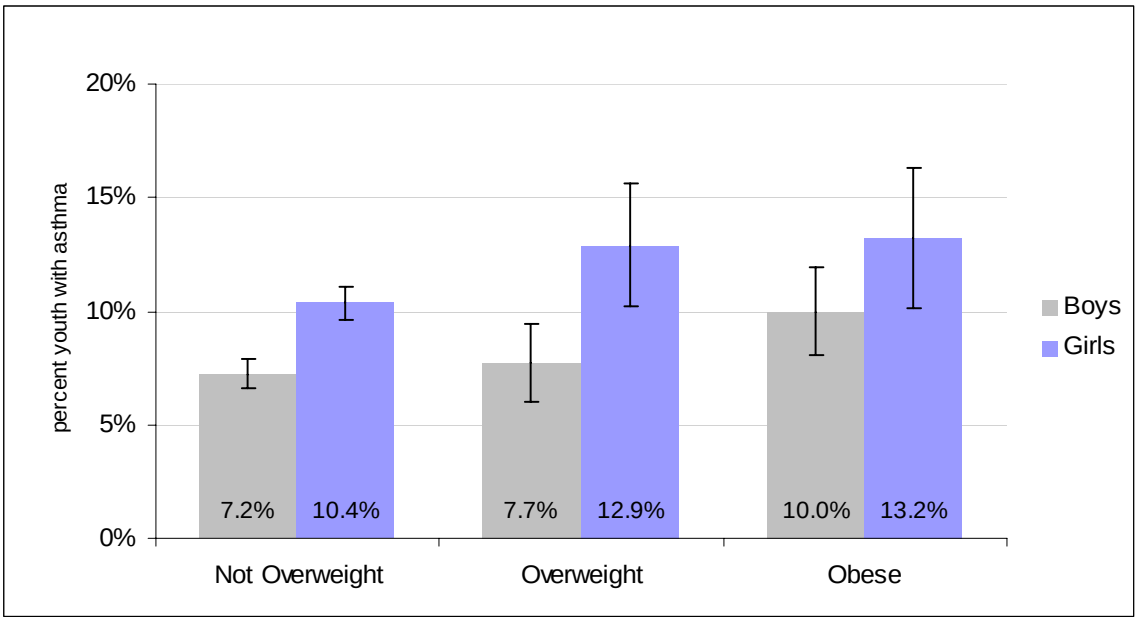
Source: 2001--03 combined Washington State Behavioral Risk Factor Surveillance System (BRFSS).

Obesity or overweight were associated with increasing prevalence of asthma for Washington boys and girls (see Figure 47).[2] This association could be explained by gender-specific factors such as small airways for boys (which might be more affected by greater body mass).

Among adults obese women had nearly double the prevalence of asthma in comparison to women who were not overweight, while among girls the difference was not as great. This might be explained by lower levels of estrogen among girls in comparison to women, if estrogen effects are associated with obesity and asthma. (see previous discussion on age and gender in Chapter IV Section A.)

[2] p<.001 for grade-adjusted association between current asthma and obese (vs. overweight/not overweight) among boys; p=.02 for grade-adjusted association between current asthma and obese/overweight (vs. not overweight) among girls.

Figure 4: Asthma prevalence by bodyweight and gender, among Washington youth



Source: 2002 and 2004 combined Washington State Healthy Youth Survey (HYS), grade-standardized for 8-10-12th grade respondents.

Asthma can be triggered by exercise. The condition called exercise-induced brochospasm, or exercise-induced asthma (EIA), is caused by a narrowing of the airways leading to the lung caused by the loss of heat, water, or both from the airways during exercise. It is caused by increased ventilation and inhalation of cool, dry air compared to the air within the lungs. It is possible that some people with asthma may avoid exercise, which contributes to obesity; however, with good asthma control strategies in place (appropriate medication and avoidance of triggers, such as exercising outdoors on days with poor air quality or near high-traffic roads) people with asthma should be able to exercise.

C. Substance Abuse

Environmental exposures or occupational exposures that cause or exacerbate asthma are typically involuntary – people inhale the air around them, including harmful substances when those are present. Some people, however, may inhale chemicals purposely to produce intoxication. In addition to other dangerous effects on the body, introduction of these substances to the lungs may be associated with development or exacerbation of asthma.

The use of inhaled intoxicants (things you purposely sniff or "huff" to get high) by middle school youth is a growing concern in substance abuse prevention.[xxii,xxiii] Inhaled intoxicants include adhesives (model airplane glue), solvents (nail polish remover, markers, paint thinner), aerosols (hairspray), cleaning agents (spot removers, keyboard cleaning fluids), food products (aerosol whipped cream, vegetable cooking spray), or

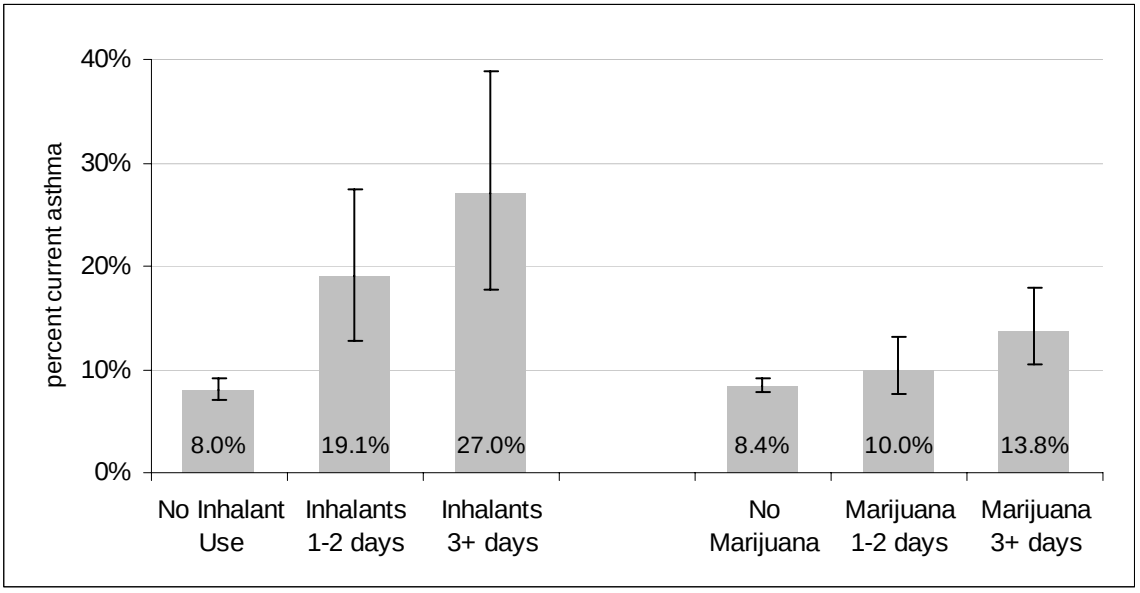
other gases (butane, propane and Freon).[xxiv] Some of these agents may also be inhaled during normal work or home life without adequate protective equipment or ventilation, but the following discussion considers only intentional inhalation for the purpose of getting high.

Inhaled intoxicant use during the past 30 days was strongly associated with asthma prevalence among 8th graders in Washington (see Figure 48, p<.001). There was no association between inhaled intoxicant use and asthma for 10th and 12th graders, but use of inhaled intoxicants is highest among middle school youth and very low among high school-aged youth. Among 8th graders, the prevalence of asthma among those who had used inhaled intoxicants more than twice during the past month was three times greater than among youth who did not use inhalants.

Inhalant users have the highest asthma prevalence of any sub-group analyzed for this report. Because it is unlikely that the onset of asthma caused the inhalant use, it is possible that the inhalant use caused the onset of asthma in at least some cases. Clearly, inhalant use does not explain most asthma occurrence: only about ten percent of the 8th graders with current asthma reported inhalant use.

Marijuana is another intoxicant that is inhaled by young people to get high. Like cigarette smoking, marijuana use increases with age. There was no association between marijuana use and asthma for high school-aged youth, but for Washington 8th graders progressively greater use of marijuana was associated with increased prevalence of asthma (p=.001).

Figure 5: Asthma prevalence by past-month inhaled substance use frequency, among Washington youth (8th grade)



Source: 2002 Washington State Healthy Youth Survey (HYS) for inhalants; 2002 and 2004 HYS combined for marijuana, 8th grade only.

As with cigarette smoking, use of inhaled intoxicants and marijuana was associated with increased asthma prevalence for middle school grades only. These associations may be

related to common risk factors (unstructured family environments, parental smoking or drug use), but regardless of these factors, use of any concentrated intoxicant in fumes or smoke is likely to aggravate asthma conditions and should be considered when managing youth with asthma.

D. Allergies

Allergies and asthma are highly inter-related. An allergy is an exaggerated immune response or reaction to some substance that is not generally harmful, while asthma is a inflammatory reaction only within the airways that can be triggered by exposure to a specific substance, but also by conditions such as change in temperature, exercise, or stress. Common allergens include pollen, mold spores, animal dander from feathered or furry animals, dust mites (a major component of house dust in humid climates) and cockroaches. These substances can also be asthma triggers (see discussion in Chapter VII). On contact with the allergen, the allergic person's body produces chemicals that result in allergy symptoms such as itchy eyes, runny nose, skin problems (Eczema) and/or a rash. These symptoms irritate the inflamed airways and lead to asthma symptoms.

Washington data are not available to describe the proportion of people with allergies, or allergies and asthma. National studies indicate that among adults, including older adults, between 60-75% of people with asthma were also atopic (demonstrated allergic reactions by skin test or in vitro test).[xxv,xxvi,xxvii]

E. Genetics

If a person has a parent with asthma, he or she is three to six times more likely to develop asthma than is a person who does not have a parent with asthma.[**Error! Bookmark not defined.**] Data from Washington are not currently available to describe the proportion of people who have genetic risk factors for asthma; however advances in human genetics related to asthma are expected to provide better information about the contribution of genetic variation to the development of disease when people are exposed to certain environmental factors and variation in individual response to therapy. The use of this genetic information will improve targeted disease prevention and health management strategies for respiratory diseases. One possible application could be testing of newborns to identify infants who might benefit from environmental modifications or immunotherapy for prevention.[xxviii]

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